

Acoustic neurinoma surgery in Belfast 1986–1989

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SUMMARY

Forty-seven acoustic neurinoma tumours have been operated on in 46 patients in the years 1987–1989. This is a considerable increase over the prevalence in the preceding ten years. Twenty-six were classified as large tumours, 18 as medium and one was small. Surgical excision was complete in 16 and incomplete in 31 cases. Two patients died in the early postoperative period. Facial nerve function was preserved in 36 (80%) of cases; of these, 27 (60%) had good function and nine (20%) fair function. Useful hearing was preserved in only two patients. The overall complication rate has been low and often of a transitory nature.

INTRODUCTION

Acoustic neurinoma presents a challenge both in diagnosis and treatment. The diagnostic challenge is to detect early and therefore smaller tumours, whilst the surgical challenge is to remove what is a benign tumour with as little morbidity as possible.

Reports of these tumours date back to 1830, when Sir Charles Bell¹ published the first clinical and autopsy case of cerebellopontine angle neurinoma. The first successful operation on an acoustic neurinoma was performed by Ballance² in 1894. Cushing³ developed an interest in these tumours in the early twentieth century and by performing partial removal was able to reduce to 20% the previous operative mortality of 80%. His technique was refined by Dandy,⁴ one of his students, who removed the capsule after enucleation of the tumour interior with a mortality rate of 22%, although all his patients were deaf and had permanent total facial paralysis.

Further advances were made in the 1960s when House⁵ developed the trans-labyrinthine approach with microsurgical removal. He achieved a 5% mortality

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rate, and preserved facial nerve function in almost 95% following total tumour removal. Recent advances have been mainly in the field of diagnostic techniques, allowing smaller tumours to be identified. These twin improvements, in surgical technique and in diagnosis, have led to a further reduction in mortality and overall morbidity. Facial nerve function is commonly preserved and in selected patients preservation of hearing may now be a realistic goal. In the ten years between 1976 and 1986 40 acoustic neurinomas were removed surgically in the Royal Victoria Hospital,⁶ an average of four per year. In the last three years 47 tumours have been removed, an increase to over 15 per year. The reasons for this increase may include heightened awareness among the medical community, the more widespread provision of CT scanners and increased expectations by patients.

The results of the surgery in the last three years are reported.

PATIENTS AND METHODS

Forty-six patients were operated on for 47 tumours between September 1986 and February 1990. Three patients had bilateral tumours: in one the first side had been dealt with before September 1986 and in a second only one side has been operated on so far. There were 18 males and 28 females. Ages ranged from 19 to 73 years with an average age of 48 years.

Symptoms on presentation are shown in Table I. All patients complained of deafness. The next most common symptoms were unsteadiness and tinnitus. Rotatory vertigo occurred in eight patients. Other symptoms included headache, facial numbness or pain, diplopia, blurring of vision and nausea and vomiting. The first symptom was deafness alone in 33 patients, unsteadiness in six, tinnitus in three, and both deafness and tinnitus together in another four.

TABLE I
Symptoms on presentation in 46 patients

	<i>n</i>	(%)
Deafness	46	100
Unsteady gait	24	52
Tinnitus	23	50
Rotatory vertigo	8	17
Headache	7	15
Facial pain/numbness	4	8
Diplopia	2	2
Blurred vision	2	4
Vomiting	2	4
Nausea in morning	1	2

Physical signs on presentation in addition to deafness are shown in Table II. Twenty-one patients were ataxic on walking with a positive Romberg's test, and a further four showed arm ataxia. Nystagmus was present in 15, decreased corneal reflexes in nine, and decreased facial sensation in seven patients. Other signs

included papilloedema (4), facial weakness (3), absent or diminished gag reflex (3), and vocal cord paresis or hypoglossal paralysis. Eighteen patients showed no physical signs whatsoever other than deafness.

TABLE II
Physical signs on presentation in addition to deafness

	<i>n</i>	<i>(%)</i>
Ataxia — gait	21	45
— arm	4	8
Nystagmus	15	32
Decreased corneal reflex	9	19
Decreased facial sensation	7	15
Papilloedema	4	8
Facial weakness	3	6
Absent/diminished gag reflex	3	6
Vocal cord paresis	1	2
Hypoglossal paralysis	1	2
No other signs	18	39

Three clinical stages are recognised. In stage I only the eighth nerve is involved with deafness and tinnitus being the only symptoms. Stage II is marked by the presence of other neurological signs or symptoms usually cerebellar ataxia and trigeminal nerve or nucleus involvement. Stage III tumours cause raised intracranial pressure and usually papilloedema.

In this series there were 18 stage I, 25 stage II and 4 stage III tumours on presentation. One tumour was small (less than 1 cm), 20 were medium sized tumours (1 – 2.5 cm) and 26 were large (greater than 2.5 cm diameter). The patient with the small tumour had previously had surgery on the opposite side for an acoustic neurinoma, with nystagmus preoperatively and was therefore classified as stage II.

All reported tumours were removed by a combined neurosurgical and otological team using the suboccipital approach.

RESULTS

There were two postoperative deaths, which occurred in patients who had large tumours. A 58-year-old female died a few hours postoperatively from a brain stem infarct, and a 63-year-old male developed chest problems in the early postoperative period and eventually died of respiratory failure.

Sixteen tumours were completely removed and 31 incompletely removed (Table III). Most complete removals were in medium sized tumours. Of the incomplete removals 11 were subtotal, 17 were partial capsular and three were intracapsular. Reasons for incomplete removal included age or debility, fluctuating vital signs, swelling of the brain or bleeding at surgery, attempts to preserve auditory or facial nerve function and tumour adherence to the brain stem.

TABLE III
Tumour size and stage at presentation and surgical excision

	Tumour stage			Excision	
	I	II	III	complete	incomplete
Small	—	1	—	—	1
Medium	11	9	—	13	7
Large	7	15	4	3	23

Facial nerve function

Postoperative facial nerve function in 45 patients is shown in Table IV. Function was graded as absent, fair when weakness and asymmetry were marked and good when normal or near normal. The two patients who died in the early post-operative period are not included. Facial nerve function was preserved in 36 (80%) of patients. Of these function was good in 27 (60%) and fair in 9 (20%). Nine patients had no residual function (20%). Two of the patients with fair results are expected to improve further. In the 15 patients where tumour excision was complete, facial nerve function was preserved in 14, of whom 11 had a good result. Of the nine patients with no postoperative facial nerve function eight had large tumours, seven of which were incompletely removed.

TABLE IV
Facial nerve function postoperatively. (Two cases who died have been excluded)

	Excision	Good	Fair	None	Total
Small	Incomplete	1	—	—	1
Medium	Complete	10	3	—	13
	Incomplete	4	2	1	7
Large	Complete	1	—	1	2
	Incomplete	11	4	7	22
	Total	27	9	9	45

Hearing

If a speech discrimination score of 50% is considered to be essential for useful hearing, then 14 patients has useful hearing preoperatively. This includes one ear with a score of less than 50% in a patient who had bilateral tumours and total loss of hearing in the other ear, his only hearing ear therefore was considered useful. Hearing was preserved in this patient and in only one other. All other patients had no useful hearing postoperatively. Two patients were referred directly to neuro-surgery from medical and neurological clinics and because of the large size of the tumours audiometry was not performed. These two patients have been excluded from consideration of hearing.

Complications

The overall complication rate has been low. Twenty-one patients had no complications whatsoever. There were no cases of wound infection or meningitis. Fifteen patients showed ataxia to some degree which has completely settled in eight so far, improved in a further five but continues to present a problem in two cases who need an aid to walk. Dysphagia was present in five patients initially, and has resolved in two of them. Four of the patients with dysphagia, plus one other patient, had vocal cord paresis postoperatively, two of whom have settled. Other complications included headache and facial pain in four cases and single cases of dysarthria or blurred vision. Cerebrospinal fluid otorrhoea occurred in one patient due to incomplete waxing of mastoid air cells, which required further surgery.

To date two patients who had partial capsular removals have shown evidence of regrowth on CT scanning and will probably require further surgery.

DISCUSSION

The mortality rate for acoustic neurinoma surgery via the suboccipital route remains low, and was 4.3% in this series. Facial nerve function was preserved in 80% of the 45 patients, and in 14 of the 15 patients where tumour excision was complete. The likelihood of hearing preservation is low. Postoperative morbidity has been low and often of a transient nature. It is well recognised that surgery on smaller tumours results in fewer complications. However, although Brainstem Evoked Response Audiometry can indicate, and CT scanning can detect small tumours, it is interesting to note that only one tumour was picked up at this stage. Whilst this compares favourably with the previous 10 year period where 78% of the tumours were large at presentation,⁶ it would decrease morbidity if these tumours could be detected earlier. Hearing preservation is only likely with small tumours. The tumour size distribution here is similar to that reported in other series. Cohn et al⁷ noted no change in size distribution from 1979 to 1986, whilst Glasscock⁸ noted a decrease in large and an increase in medium tumours but no change in the number of small tumours presenting between 1975 and 1985. Similarly Thomsen⁹ had only one small tumour in 300 cases, the majority being large tumours greater than 2.5 cm.

An advantage of the translabyrinthine approach is that it avoids damage to the cerebellum and therefore produces less ataxia postoperatively. Thomsen⁹ noted a 7% incidence of ataxia using this approach. Ataxia was a problem in only two of our cases both of whom were elderly. Cerebrospinal fluid leakage is a relatively common complication in other series, especially with the translabyrinthine approach, occurring in up to 20% of cases.¹⁰⁻¹³ This occurred in only one patient in this series (2.2%). Facial nerve function was preserved in 80% (60% with a good result) which is similar to other series.^{9, 14, 15} Hardy et al¹⁴ pointed out that the presence of preoperative facial weakness and a tumour size greater than 2.5 cm diameter are poor prognostic signs for facial nerve recovery.

It would seem that despite the surgical advances, increased diagnostic ability and more widespread provision of this technology, little apparent effect on early diagnosis has occurred. Perhaps education of the medical community to refer earlier the patients complaining of asymmetrical hearing loss is the way forward.

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